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OUTLINES OF COTTON CULTURE IN THE SAN JOAQUIN VALLEY OF CALIFORNIA

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AVOIDANCE OF UNSUITABLE LAND

Yields of nearly 3 bales an acre from 10-acre contest fields in Kern County, in the San Joaquin Valley of California, in 1929, 1930, and 1931 signify that conditions for the production of cotton are very favorable. Natural resources of soil and season are combined with a highly organized 1-variety system of production, but the average yields for the valley in those years were less than 1 bale per acre, or approximately one-third as much as the best yields of selected 10-acre plots. Such differences between the yields of contest plots and the valley average would indicate that the full possibilities of production have not been attained and that a general improvement is practicable.

Planting cotton on land that is not well suited to production is detrimental to the industry. Not only are the yields low and unprofitable, but the quality of the fiber is poor, and the reputation and commercial value of the production of the entire valley is impaired. It is evident that much of the land now planted to cotton should be used for crops that improve the soil and do not so readily reflect the condition of the soil. (Fig. 1.)

Yields of less than 1 bale per acre in the San Joaquin Valley usually show very little or no profit to the grower and only add to the now heavy burden of overproduction. If the marginal or less productive land were withdrawn from production, and if the water and labor were skillfully applied to the remaining portion of the cotton acreage, it is probable that the total production of the valley would be as large as it is now, and that the net returns to the farmers would be greater. The acre yields on the good land undoubtedly can be increased through the use of improved cultural methods, and the quality of the product can be improved.

Farmers who plant on poor land usually are careless in the handling of the crop, and the combination results in an unprofitable yield of an inferior product that injures the reputation of all of the cotton from the western irrigated valleys. Increased yields, brought about through the elimination of marginal lands and through the use of better cultural methods, would reduce the cost of production as well as improve the quality of the fiber. The growers then can enter the market with a superior product that demands a premium and probably costs less to produce than the uneven wasty fiber that results from careless farming.

SEED SELECTION

Special attention has been given in certain organized communities of the Southwest to the problems of providing adequate supplies of pure seed. One-variety communities have been established, and provisions have been made for maintaining and distributing supplies of pure seed at a nominal cost. In the San Joaquin Valley a cooperative arrangement exists between the United States Department of Agriculture and the Farm Bureau Planting Cottonseed Distributors, whereby good planting seed is made available to all growers at a very reasonable cost. This arrangement is made possible through the cooperation of the growers in establishing and maintaining a 1-variety system of production. Under this system the Acala variety is grown exclusively, and select stocks of seed are increased each year for general distribution.

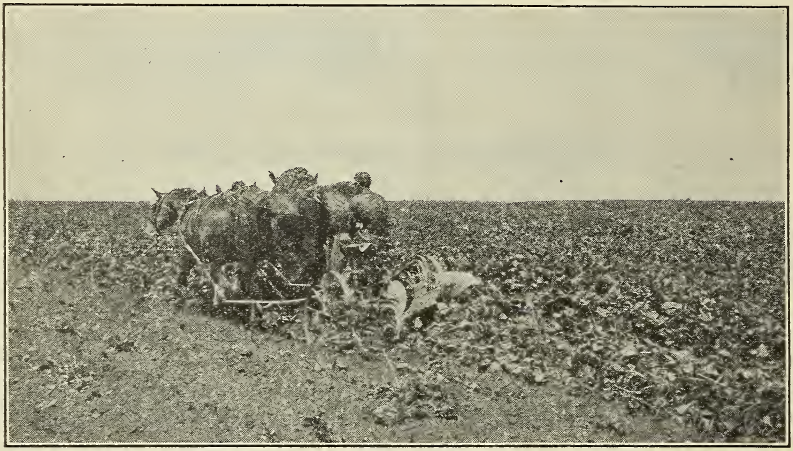

FIGURE 1.—Summer cover crop of cowpeas. Good crops of cowpeas, vetch, alfalfa, and other soil improvers can be grown on land that is too poor for profitable cotton production. This field produced less than 1 bale of cotton per acre the previous season

TIME OF PLANTING

Cotton planting usually begins in the southern end of the San Joaquin Valley about March 15 to 25 and continues until about May 1. Though cotton sometimes is planted earlier than March 15, or later than May 1, this interval usually covers the advisable planting dates. Early April plantings have proved very satisfactory in most sections of the valley, and it is doubtful whether plantings in March ever gain advantages sufficient to compensate for the additional risks of frost damage. Experiments conducted at Shafter, in Kern County, in 1929, 1930, and 1931 indicate that the first of April may be the best time to plant. (Fig. 2.)

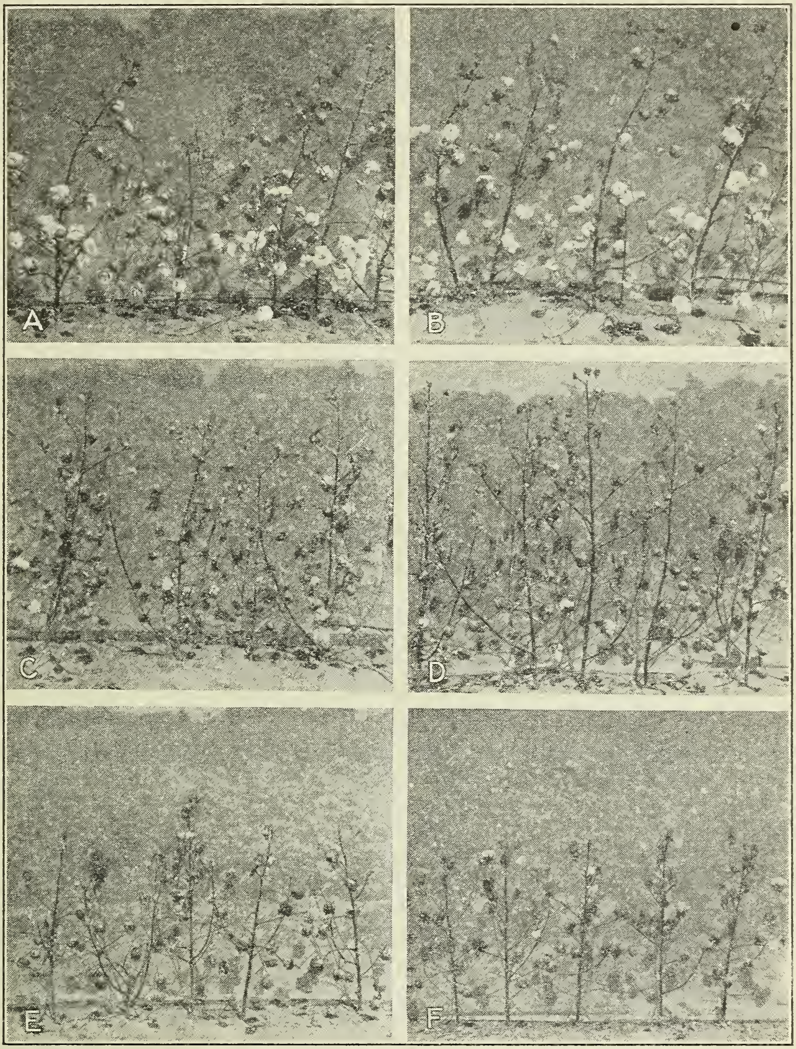

FIGURE 2.—Time of planting. Condition on September 1 of cotton planted on different dates; A, Mar. 20; B, Apr. 5; C, Apr. 20; D, May 5; E, May 20; F, June 5. The leaves were removed from the plants just before photographing to show the fruit development. Note that the Mar. 20 and Apr. 5 plantings are about equal with respect to earliness

SEEDLING STAND

Cotton culture is relatively new in the San Joaquin Valley, and the cultural methods used by most of the farmers are based upon the experience of only a few years. In most cases, however, where large yields are produced a few basic principles that appear to be essential to maximum production are adhered to.

Good seedling stands are important and are fairly easy to obtain in most sections of the valley. If the seed bed is well prepared and plenty of seed is used there is usually little difficulty. Heavy seeding increases slightly the work of chopping, but the results from a good stand more than repay the extra labor, and at the present cost of good planting seed there is little excuse for skimping. The seed should be planted 1½ to 2 inches deep and at a rate of 25 to 35 pounds per acre.

A good irrigation prior to planting is necessary in most cases. In some places it is possible to obtain good stands without irrigating before planting, but the plants are likely to need water during the early seedling stage, and little water if any is saved in producing the crop. An early irrigation may be followed by excessive vegetative growth of the plants and by the development of shallow root systems, which will necessitate more frequent irrigations later in the season.

CHOPPING

The cotton seedlings are thinned by laborers with hoes, the operation being known as "chopping." The problems of chopping are closely related to those of seedling stand, and the reward for obtaining a good seedling stand is often lost, at least in part, as a result of careless chopping. Much of the cotton in the San Joaquin Valley is chopped too early. Early chopping robs the seedlings of the protection of their neighbors and renders them more susceptible to the leaf-cut disorder (tomosis) and to other effects of adverse conditions. Also the seedling mortality caused by sore shin (Rhizoctonia) is rather high in many localities early in the spring. The mortality of the stand may be greatly reduced if chopping is deferred until the seedlings are 6 to 8 inches tall.

In addition to the injuries and loss of stand due to chopping too early, many good stands are ruined by careless, irresponsible laborers. The labor of chopping increases as the distance is reduced between plants in the row, and most choppers who are working on an acre basis are inclined to space the plants as far apart as their employer will permit. Under most conditions in the San Joaquin Valley the plants should be spaced not more than 12 inches apart in the row for maximum yield. One of the best-yielding and most practical spacings is about 8 to 15 inches between hills of 1 to 3 plants, which makes an average of approximately 2 plants to every 12 inches of row space.

CULTIVATION

Cultivation is largely a matter of keeping the cotton free from weeds and of breaking up the surface of the soil after irrigation so that the flow of water is retarded and the soil permeated to a greater extent in subsequent applications. The number of cultivations required in growing a crop of cotton depends upon the difficulties encountered in controlling weeds. In the absence of weeds relatively little cultivation may be required. It has been proved by many experiments that cultivation does not conserve moisture except by controlling the weeds and filling any cracks that may have formed. Merely stirring the surface soil is of little value, and late cultivations may be injurious, breaking branches and cutting many of the feeding roots. Large yields have been obtained without cultivation, or with only one cultivation after chopping, primarily to put the land in order for irrigation.

ROOT DEVELOPMENT

Recent studies of plant development, revealing the rapid penetration of the soil by roots of cotton seedlings, may assist in the proper handling of plants with regard to irrigation. The roots of cotton seedlings develop much more rapidly and reach greater depths than is generally supposed. Under favorable conditions in the San Joaquin Valley cotton roots may penetrate to depths of 3 to 5 feet by the time the seedlings are 8 to 10 inches in height. (Fig. 3.) This rapid penetration of the roots renders it possible to withhold water for a long period after planting, since the seedlings are able to draw moisture from the lower soil, even though the surface soil appears hard and dry. Adding unnecessary water may result in an undesirable rank growth of the plants. Where the vegetative growth is somewhat restricted the plants begin flowering and fruiting earlier in the season. Once a definite condition of fruit production is established and a few bolls have been set, there is less danger of subsequent irrigations causing excessive vegetative growth. (Fig. 4.)

Withholding water during the early stage of seedling development is a common practice among the best growers, but there is a general tendency to begin irrigating too early. This is probably due in part at least to a lack of knowledge regarding the depth of seedling root penetration. It is common practice among cotton growers to pull up seedlings to see how deep the roots have penetrated and then to dig down with a shovel to learn the soil-moisture conditions. In such cases the taproot is usually broken off in the hard soil near the surface when the plant is pulled up, and digging in the surface soil may indicate that irrigation is needed, when in reality the roots may go down several feet to where moisture is abundant.

EFFECTS OF IRRIGATION

The behavior of the crop may be influenced to a remarkable extent in regard to the size of plant, fruiting habits, time of maturity, seasonal water requirements, etc., by the time of application of the first irrigation after planting. Early irrigation tends to induce vegetative growth and to delay fruit production, building up a large plant structure with relatively few early bolls. On the other hand, vegetative growth may be retarded and fruit production advanced by deferring the first irrigation after planting. The extent to which this first irrigation may be deferred in practice depends

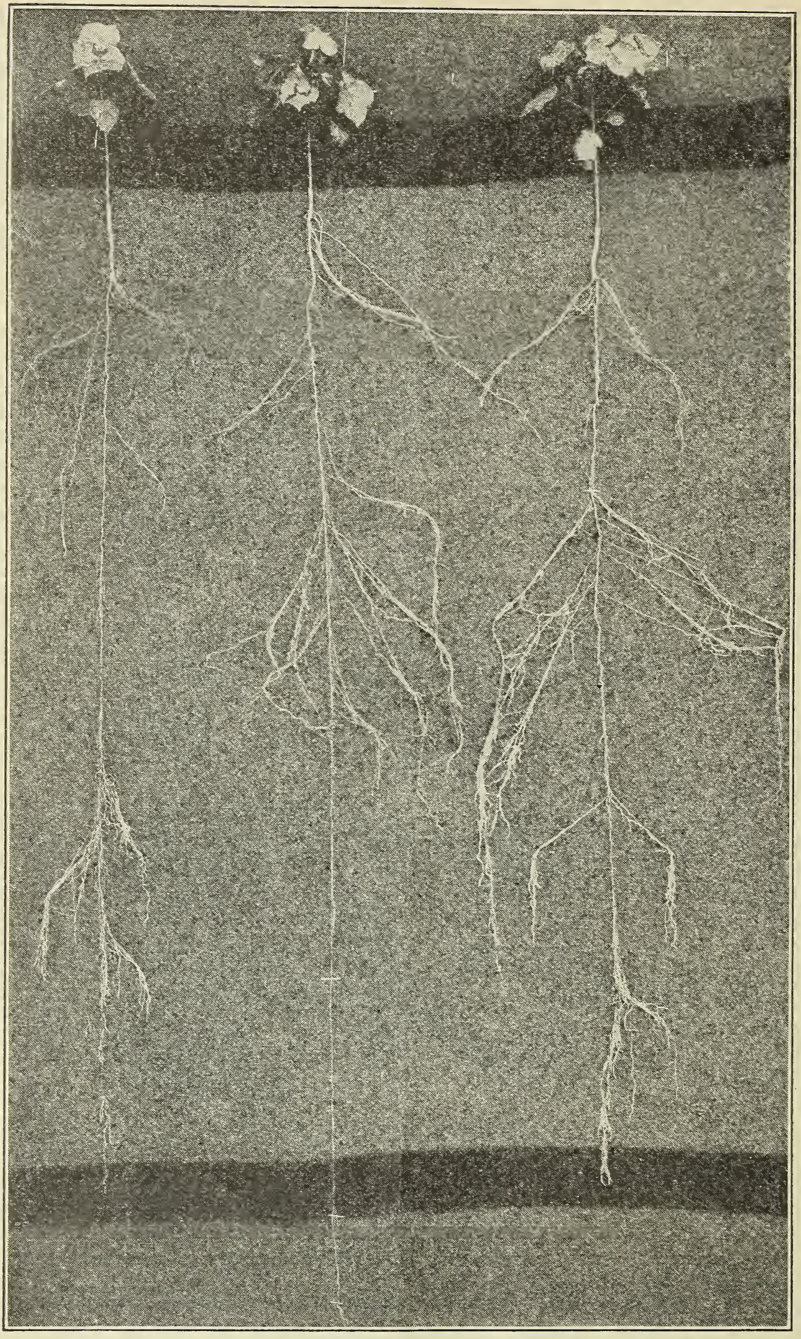

FIGURE 3.—Seedling root development. Cotton seedling roots develop rapidly and penetrate to depths several times greater than the height of the plant. Seedlings 6 to 8 inches tall may have roots 2 to 5 feet below the surface

upon soil and seasonal conditions. General observations indicate that in many cases one and sometimes two of the early irrigations usually applied are not necessary for the best development of the plants.

Each grower should study the plant behavior, consider the conditions in his particular locality, and learn to judge when it is most desirable to irrigate. As a general rule, the longer the first irrigation after planting is deferred the smaller the plants will remain and the earlier the crop will mature. On land where the plants in previous years have grown too large and rank and the crop has matured too late, it is often possible to restrict the development of the plants and produce a normal crop by deferring the first irrigation after planting.

In localities where early maturity is an important factor in production many farmers irrigate early, with the idea of forcing the plants to develop rapidly and set a large crop of bolls, and then withhold water late in the season to force maturity. Although this procedure seems logical, it is contrary to the nature of the cotton plant and is the opposite of what should be done to produce an early-maturing crop. The cotton plant is by nature a perennial tropical shrub, and in a rich soil with an abundant supply of water early in the season it tends to grow large and bushy instead of setting fruit promptly. The rank overgrown plants may eventually set a crop of bolls, but withholding water at that stage will not induce the bolls to mature earlier. If water is withheld and the overgrown plants are allowed to suffer, some of the nearly mature bolls may be "popped" open prematurely, but in such cases the lint is likely to be soft and weak.

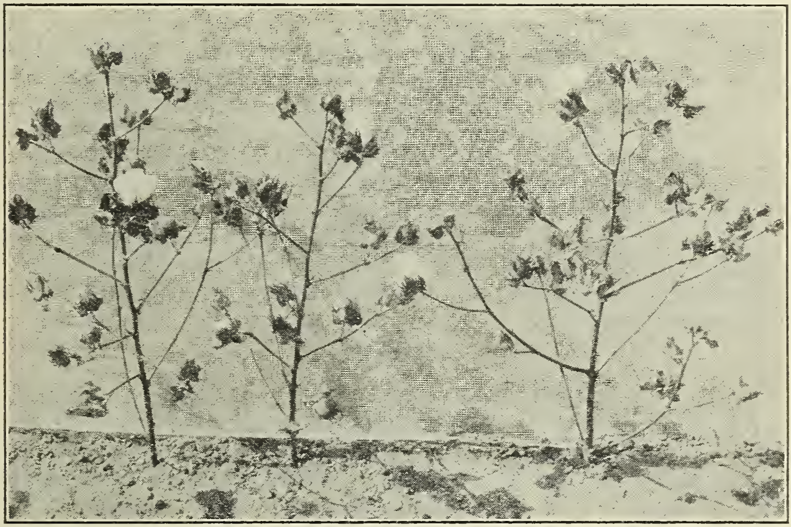

FIGURE 4.—Fruit development at first irrigation. These plants with leaves removed show a desirable state of fruit development at the time of the first irrigation. This cotton was planted Apr. 20 and irrigated the first time July 14, when this photograph was taken

RIPENING AN EARLY CROP

Earliness in cotton is largely a matter of balance in crop production. Under rainfall conditions an early crop is produced by planting an early variety, but different factors of earliness may be distinguished. The yield may be restricted if too many early bolls are set in proportion to the size of the plant, so that all the food that the plant can manufacture is used to support the crop already set. at the expense of further development. The best varieties for irrigated land are those that maintain a balance between fruit production and vegetative development and continue to fruit throughout the season. Such varieties may be forced into early maturing habits if growth is sufficiently retarded by deferring the first irrigation after planting, but it must be understood that earliness from any source may limit the possible yield and is undesirable except where climatic conditions make it absolutely necessary.

In the San Joaquin Valley extreme earliness is less essential because of the long growing season, and vegetative development of the plants should be restricted only to the extent of inducing fruit production and preventing the plants from becoming too large in rich soil. Where the soil is less fertile there is less occasion to restrict the growth of the plants, but on good cotton land it may be found to be desirable to delay the first irrigation after planting until the plants have begun to produce fruit. The extent of delaying in order to obtain the best results is a matter for the individual grower to determine by experience, since it varies greatly with different soil and seasonal conditions.

SUMMARY

Although remarkably high yields of cotton often are obtained in the San Joaquin Valley of California, it appears that the full possibilities of production are not yet realized. Average yields from large acreages can not be expected to equal those of small selected plots, because of soil inequalities; but applying the same cultural treatments to the larger plantings should increase the yield substantially and bring corresponding improvement in the quality of the product. To take out of production marginal or low-yielding land would further improve the general quality of the crop and facilitate its marketing.

Poor stands and careless chopping are responsible for reduced yields in many cases. Observations indicate that the average stand should be increased 25 to 50 per cent, but with a thicker stand more care must be exercised in the chopping operation.

The amount of water to apply and the time to apply it are probably the most important problems of the average grower. Irrigating too early may cause excessive vegetative development, in the richer and heavier soils; but after the first irrigation has been applied the plants should be kept in a good growing condition throughout the season.

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